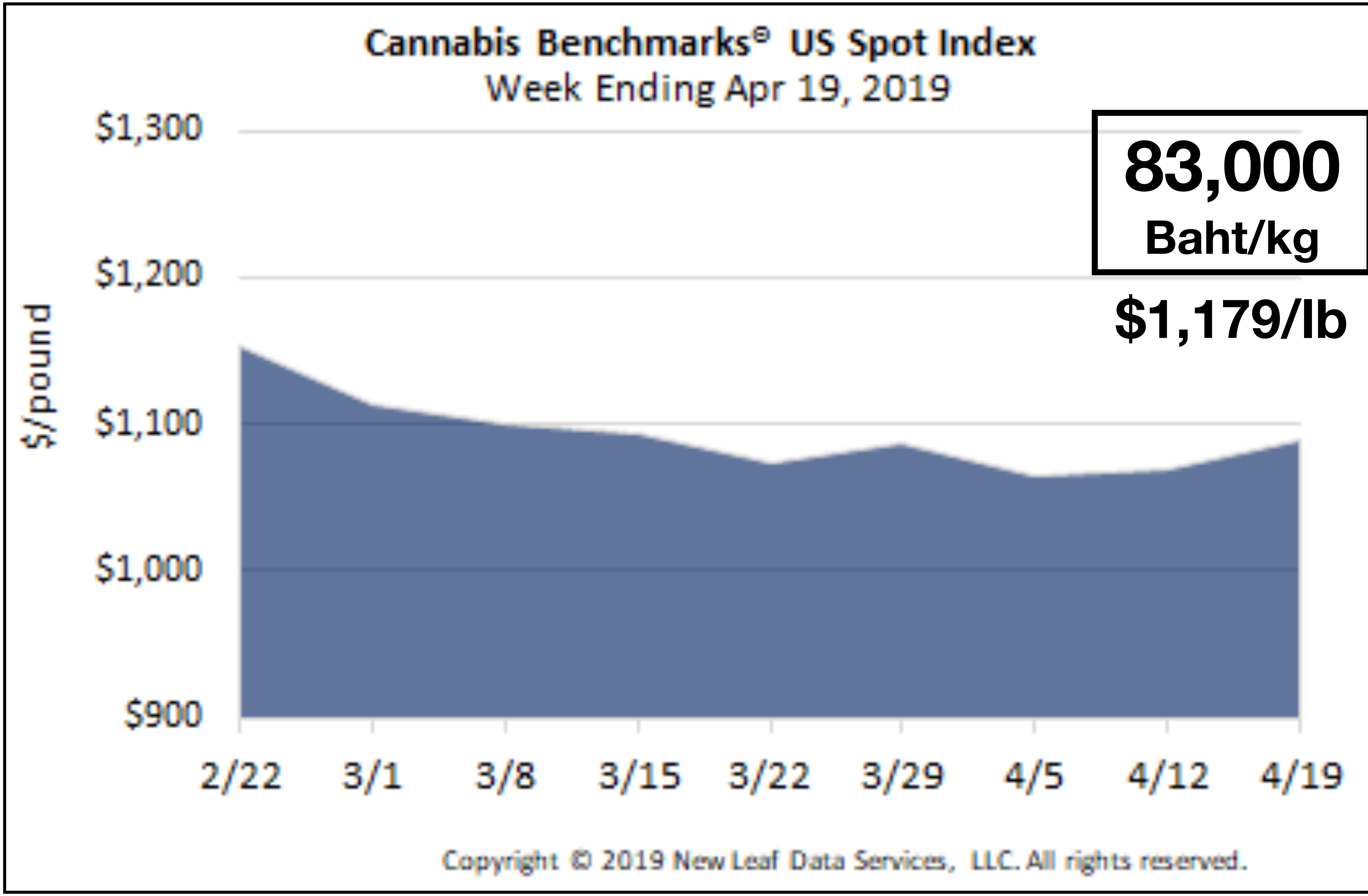
Welcome

Cannabis & Cancer What's NEXT?

Somchai Thanasitthichai MD, FRCST

Deputy Director National Cancer Institute


Cannabis Benchmarks® US Spot Index
Week Ending Apr 19, 2019
$1,300
$1,200
$1,100
$1,000
$900
$/pound
2/22
3/1
3/8
3/15
3/22
3/29
4/5
4/12
4/19
83,000
Baht/kg
$1,179/lb
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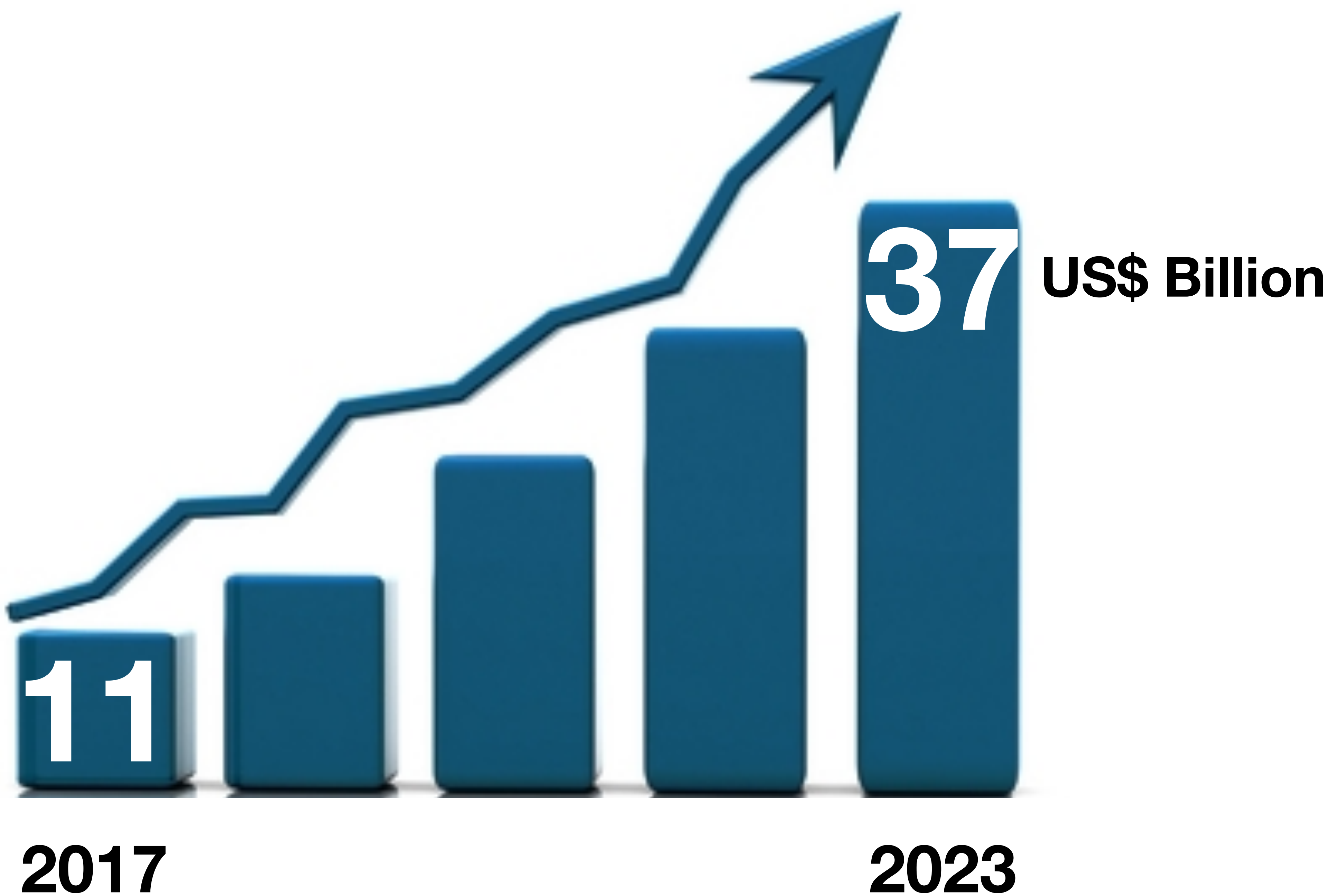
Global Medical Cannabis Market



Source: Research and Markets November 01, 2018

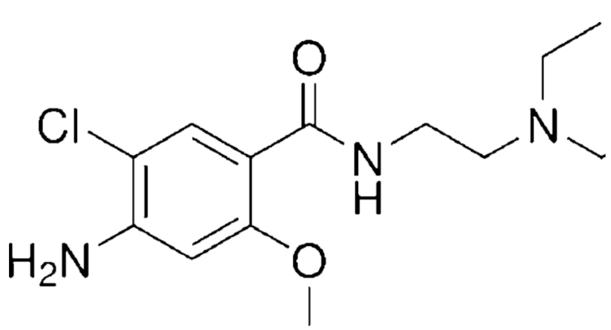
‘When dealing with people, remember you are not dealing with creatures of logic, but creatures of emotion’

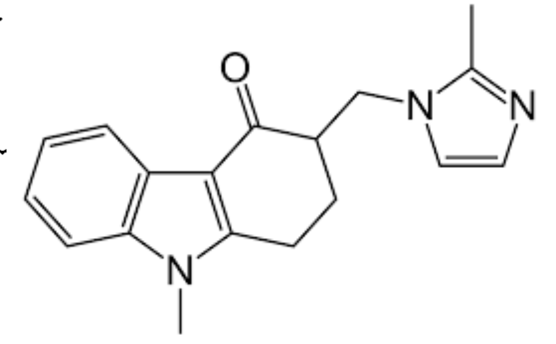
-Dale Carnegie

“การแจกจ่ายกัญชา
เพื่อรักษาผู้เจ็บป่วย
เป็นเรื่องศีลธรรมที่ต้องทำ และ
อยู่เหนือกฎระเบียบล้าหลังใดๆ”

-เดชา ศิริภัทร
ประธานมูลนิธิข้าวขวัญ

Cannabis for cancer evaluation





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DEPARTMENT OF MEDICAL SERVICES

NCI Thailand

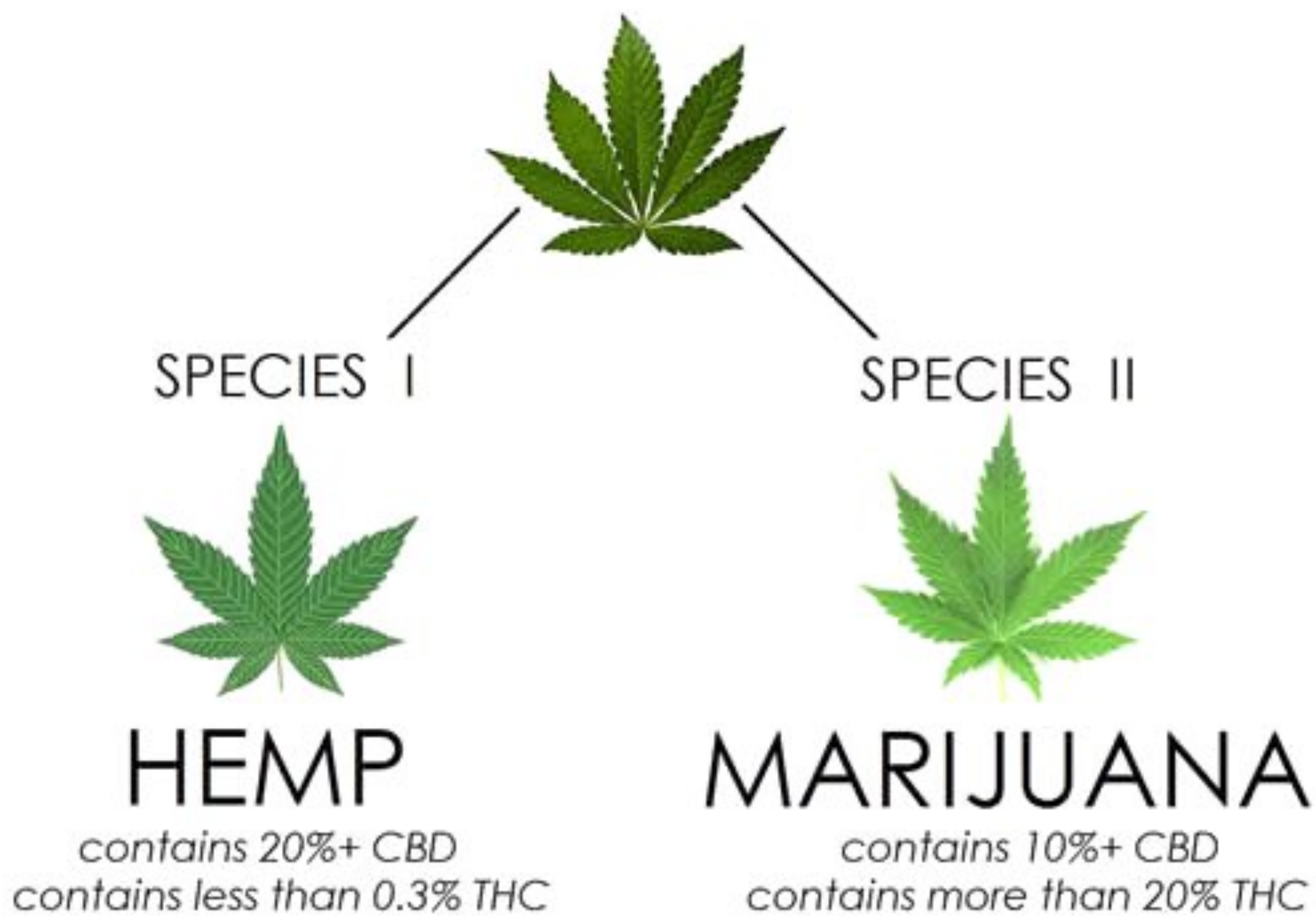
สารสกัดกัญชา ใช้ในสภาวะใดบ้าง

สำหรับผู้ป่วยมะเร็ง ??

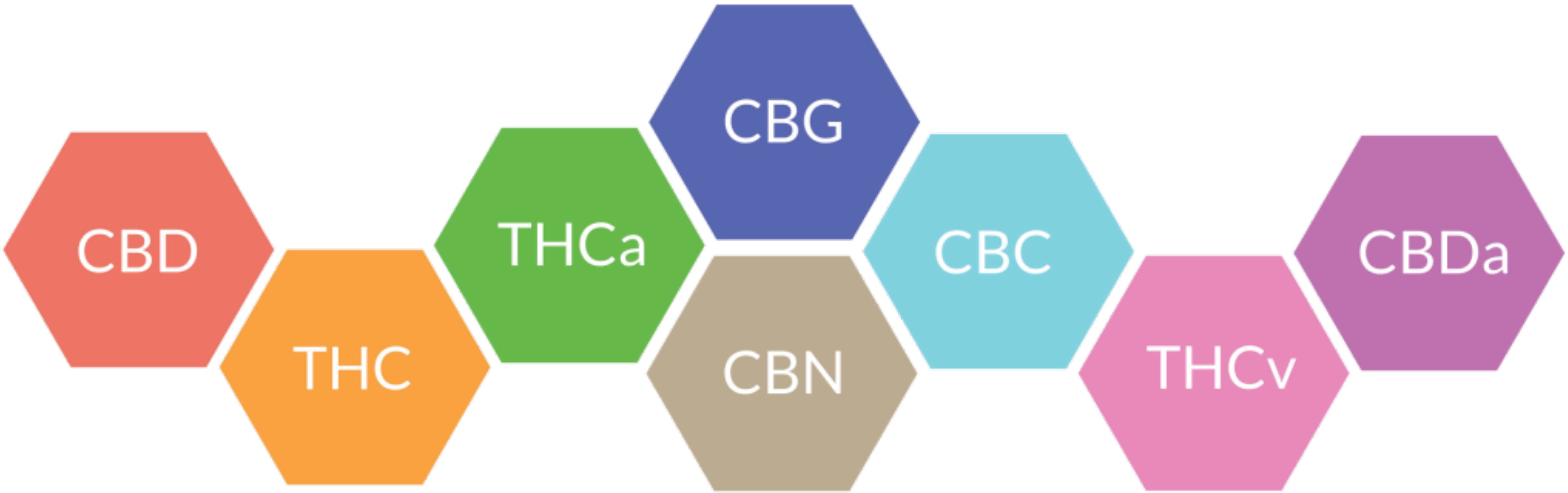
ข้อควรระวัง.. ??

ทำไมต้องมีงานวิจัย เรื่องนี้.??

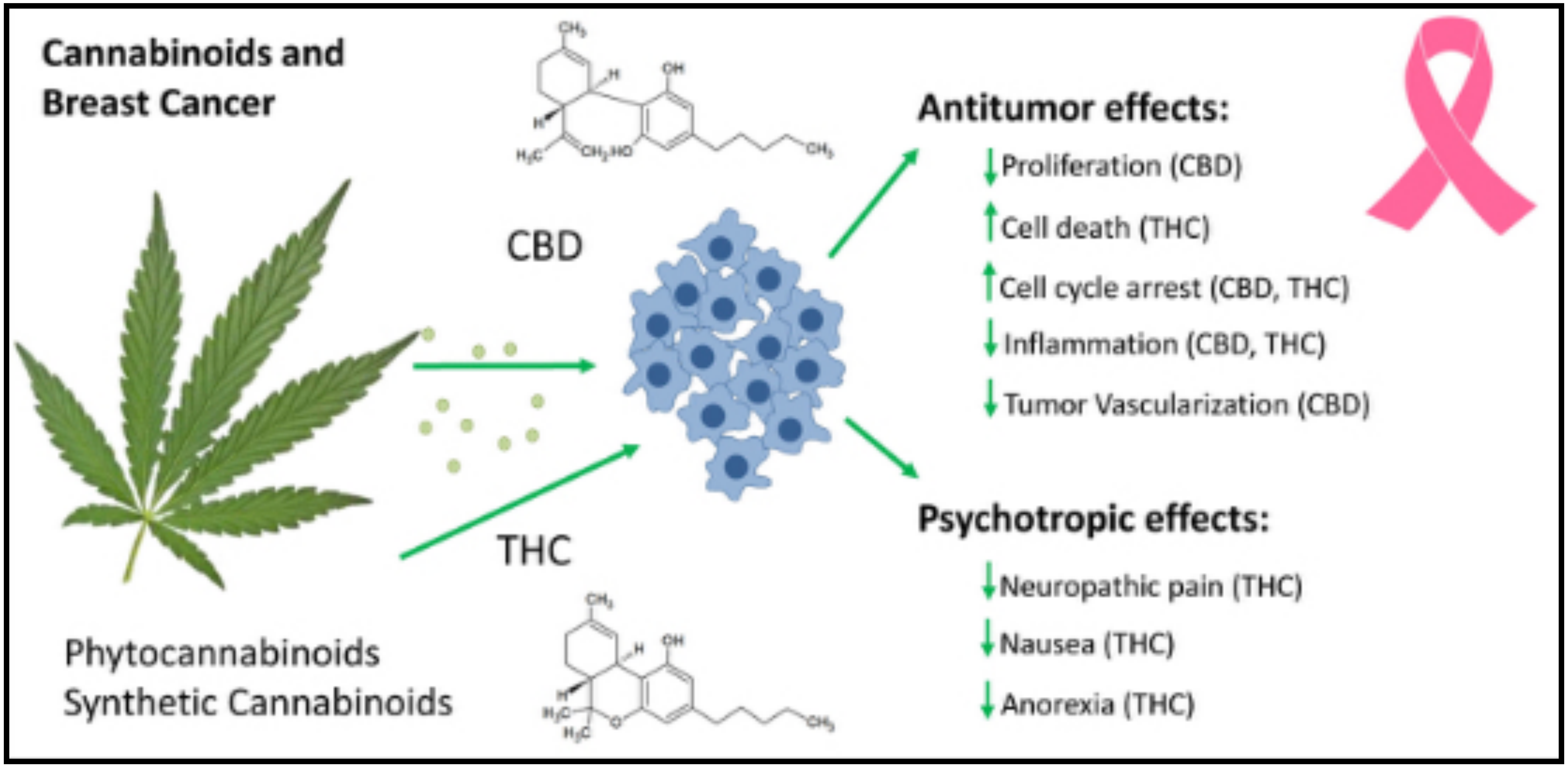
CANNABIS


SPECIES I
SPECIES II
HEMP
contains 20%+ CBD
contains less than 0.3% THC
MARIJUANA
contains 10%+ CBD
contains more than 20% THC

Cannabinoids



Potential use of Cannabis in Cancer



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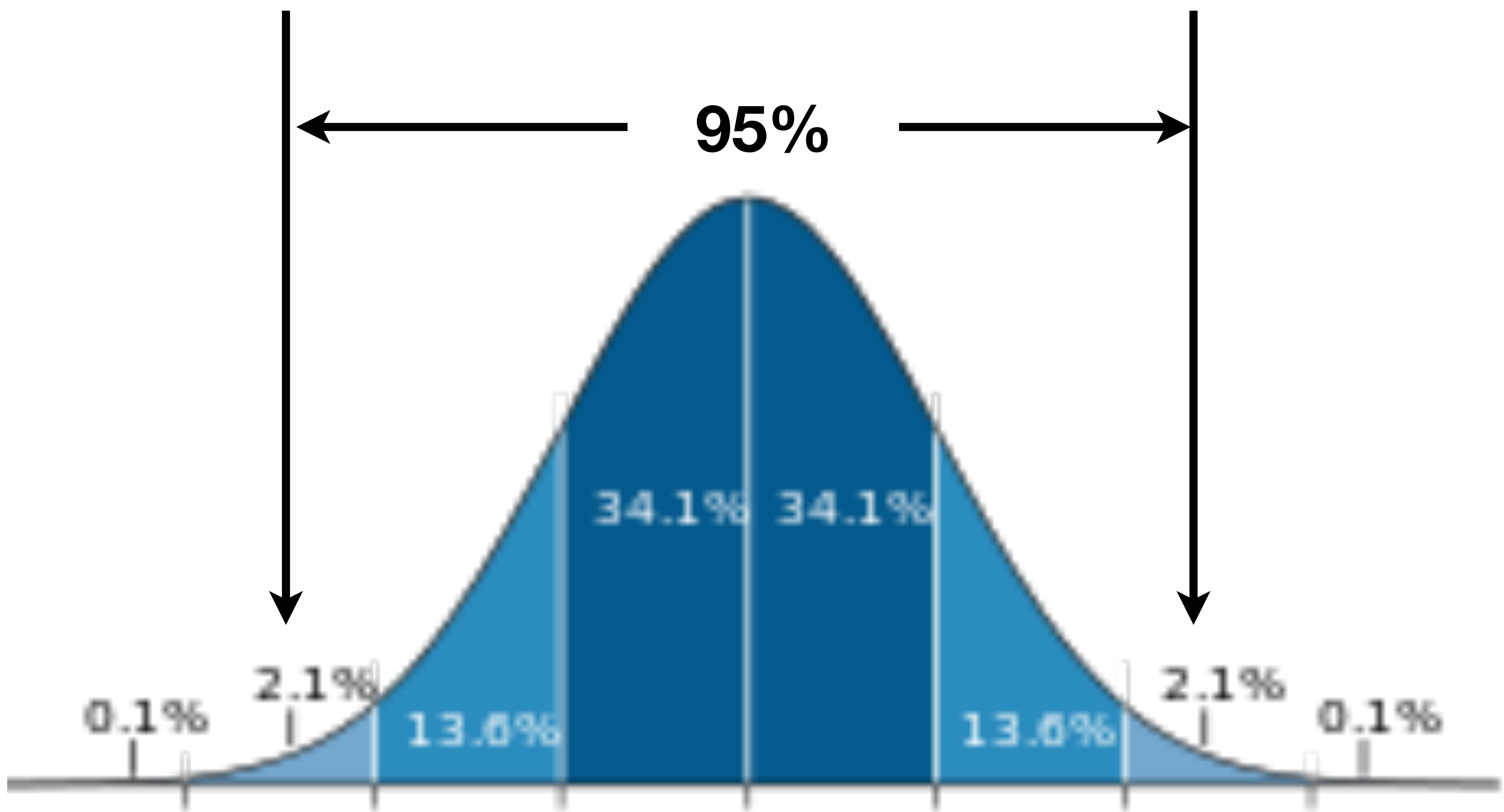
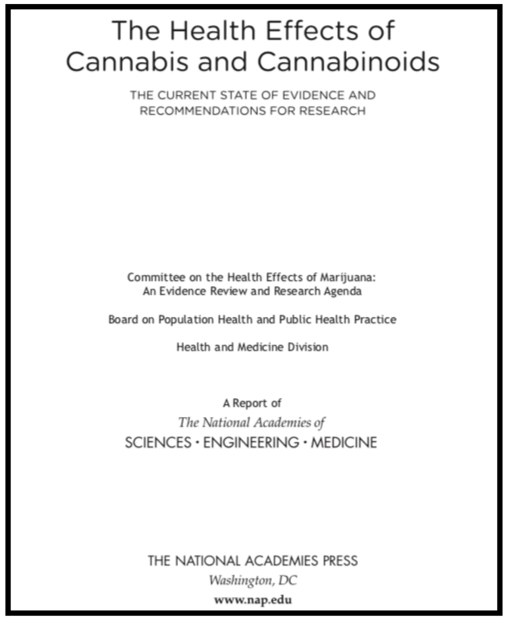
DEPARTMENT OF MEDICAL SERVICES

ยาหรือการรักษามาตรฐานที่จะนำมาใช้ทางการแพทย์



แหล่งข้อมูลที่นำมาศึกษา

รายงานล่าสุดถึงปี 2019
(1999-2019)


The Health Effects of
Cannabis and Cannabinoids

THE CURRENT STATE OF EVIDENCE AND
RECOMMENDATIONS FOR RESEARCH

Committee on the Health Effects of Marijuana:
An Evidence Review and Research Agenda

Board on Population Health and Public Health Practice

Health and Medicine Division

A Report of
The National Academies of
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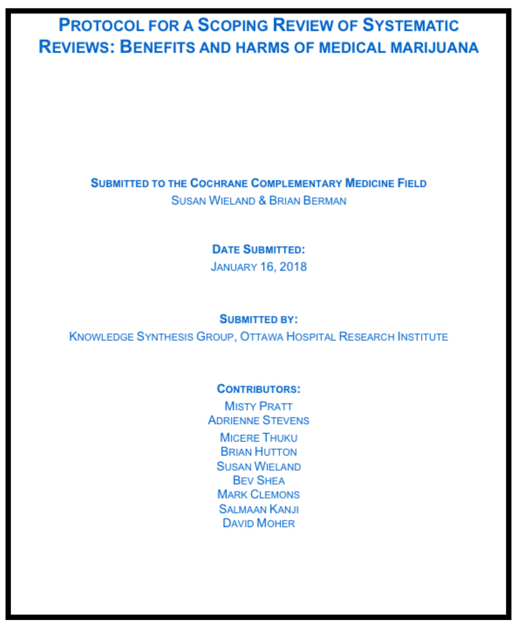
PROTOCOL FOR A SCOPING REVIEW OF SYSTEMATIC REVIEWS: BENEFITS AND HARMS OF MEDICAL MARIJUANA

SUBMITTED TO THE COCHRANE COMPLEMENTARY MEDICINE FIELD
SUSAN WIELAND & BRIAN BERMAN

DATE SUBMITTED:
JANUARY 16, 2018

SUBMITTED BY:
KNOWLEDGE SYNTHESIS GROUP, OTTAWA HOSPITAL RESEARCH INSTITUTE

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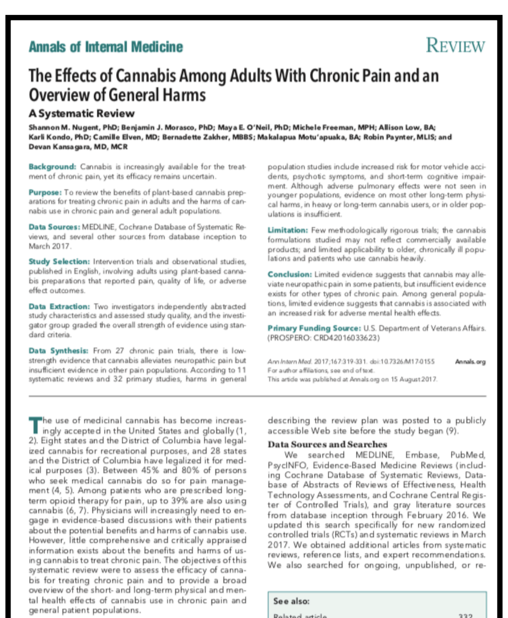
การทบทวนอย่างเป็นระบบ
การวิเคราะห์เชิงเปรียบเทียบ
รายงานวิจัยแบบสุ่ม
รายงานวิจัยแบบการสังเกต


Annals of Internal Medicine REVIEW

The Effects of Cannabis Among Adults With Chronic Pain and an Overview of General Harms

A Systematic Review

Shannon M. Nugent, PhD; Benjamin J. Morasco, PhD; Maya E. O'Neil, PhD; Michele Freeman, MPH; Allison Low, BA; Karli Kondo, PhD; Camille Elven, MD; Bernadette Zakher, MBBS; Makalapua Motu'apuaka, BA; Robin Paynter, MLIS; and Devan Kansagara, MD, MCR

Background: Cannabis is increasingly available for the treatment of chronic pain, yet its efficacy remains uncertain.

Purpose: To review the benefits of plant-based cannabis preparations for treating chronic pain in adults and the harms of cannabis use in chronic pain and general adult populations.

Data Sources: MEDLINE, Cochrane Database of Systematic Reviews, and several other sources from database inception to March 2017.

Study Selection: Intervention trials and observational studies, published in English, involving adults using plant-based cannabis preparations that reported pain, quality of life, or adverse effect outcomes.

Data Extraction: Two investigators independently abstracted study characteristics and assessed study quality, and the investigator group graded the overall strength of evidence using standard criteria.

Data Synthesis: From 27 chronic pain trials, there is low-strength evidence that cannabis alleviates neuropathic pain but insufficient evidence in other pain populations. According to 11 systematic reviews and 32 primary studies, harms in general population studies include increased risk for motor vehicle accidents, psychotic symptoms, and short-term cognitive impairment. Although adverse pulmonary effects were not seen in younger populations, evidence on most other long-term physical harms, in heavy or long-term cannabis users, or in older populations is insufficient.

Limitation: Few methodologically rigorous trials; the cannabis formulations studied may not reflect commercially available products; and limited applicability to older, chronically ill populations and patients who use cannabis heavily.

Conclusion: Limited evidence suggests that cannabis may alleviate neuropathic pain in some patients, but insufficient evidence exists for other types of chronic pain. Among general populations, limited evidence suggests that cannabis is associated with an increased risk for adverse mental health effects.

Primary Funding Source: U.S. Department of Veterans Affairs. (PROSPERO: CRD42016033623)

Ann Intern Med. 2017;167:319-331. doi:10.7326/M17-0155 **Annals.org**
For author affiliations, see end of text.
This article was published at Annals.org on 15 August 2017.

The use of medicinal cannabis has become increasingly accepted in the United States and globally (1, 2). Eight states and the District of Columbia have legalized cannabis for recreational purposes, and 28 states and the District of Columbia have legalized it for medical purposes (3). Between 45% and 80% of persons who seek medical cannabis do so for pain management (4, 5). Among patients who are prescribed long-term opioid therapy for pain, up to 39% are also using cannabis (6, 7). Physicians will increasingly need to engage in evidence-based discussions with their patients about the potential benefits and harms of cannabis use. However, little comprehensive and critically appraised information exists about the benefits and harms of using cannabis to treat chronic pain. The objectives of this systematic review were to assess the efficacy of cannabis for treating chronic pain and to provide a broad overview of the short- and long-term physical and mental health effects of cannabis use in chronic pain and general patient populations.

describing the review plan was posted to a publicly accessible Web site before the study began (9).

Data Sources and Searches

We searched MEDLINE, Embase, PubMed, PsycINFO, Evidence-Based Medicine Reviews (including Cochrane Database of Systematic Reviews, Database of Abstracts of Reviews of Effectiveness, Health Technology Assessments, and Cochrane Central Register of Controlled Trials), and gray literature sources from database inception through February 2016. We updated this search specifically for new randomized controlled trials (RCTs) and systematic reviews in March 2017. We obtained additional articles from systematic reviews, reference lists, and expert recommendations. We also searched for ongoing, unpublished, or re-

See also:
Related article 332

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DEPARTMENT OF MEDICAL SERVICES

ศักยภาพของกัญชา ทางการแพทย์(1)

‘มีหลักฐาน และข้อมูลเพียงพอ ถึง ประสิทธิผล ในการลดอาการคลื่นไส้อาเจียน จากยาเคมีบำบัด (สารสกัดกัญชา ชนิดรับประทาน)’

เชื่อว่า ผ่านกลไก 3(5-HT3), CB1& GABA receptor

สารสกัด THC & CBD จากต้นกัญชาสเปรย์พ่นปาก
(100 microlitre spray: THC 2.7 mg & CBD 2.5 mg)

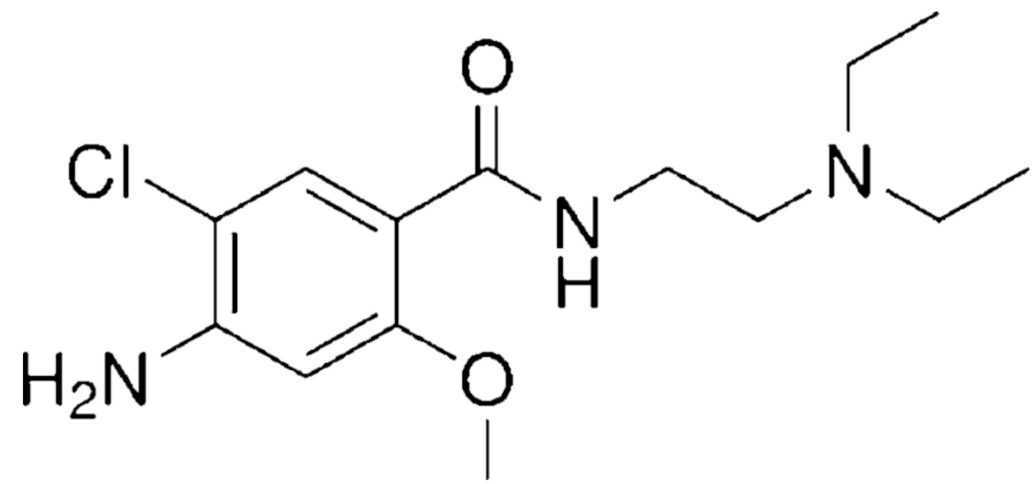
สารสกัดกัญชา & ผลข้างเคียง ระยะสั้น

- เหตุการณ์ไม่พึงประสงค์โดยรวม 3.03 เท่า (OR 3.03 [95%CI 2.42, 3.80])
- รุนแรง (serious) 1.41 เท่า (OR 1.41 [95%CI 1.04, 1.92])
- ผู้ป่วยถอนตัวเนื่องจาก AE 2.94 เท่า (OR 2.94 [95%CI 2.18, 3.96])
- *อาการผิดปรกติทางระบบประสาท 3.17 เท่า (OR 3.17 [95%CI 2.20, 4.58])*
- *อาการผิดปรกทางจิต 3.10 เท่า (OR 3.10 [95%CI 1.81, 5.29])*
- *Disorientation 5.41 เท่า (OR 5.41 [95%CI 2.61, 11.19])*
- Dizziness 5.09 เท่า (OR 5.09 [95%CI 4.10, 6.32])
- Euphoria 4.08 เท่า (OR 4.08 [95%CI 4.08, 7.64])
- Confusion 4.03 เท่า (OR 4.03 [95%CI 2.05, 7.97])

Whiting PF. Cannabinoids for medical use : a systematic review and meta-analysis. JAMA 2015;313(24):2456-73.

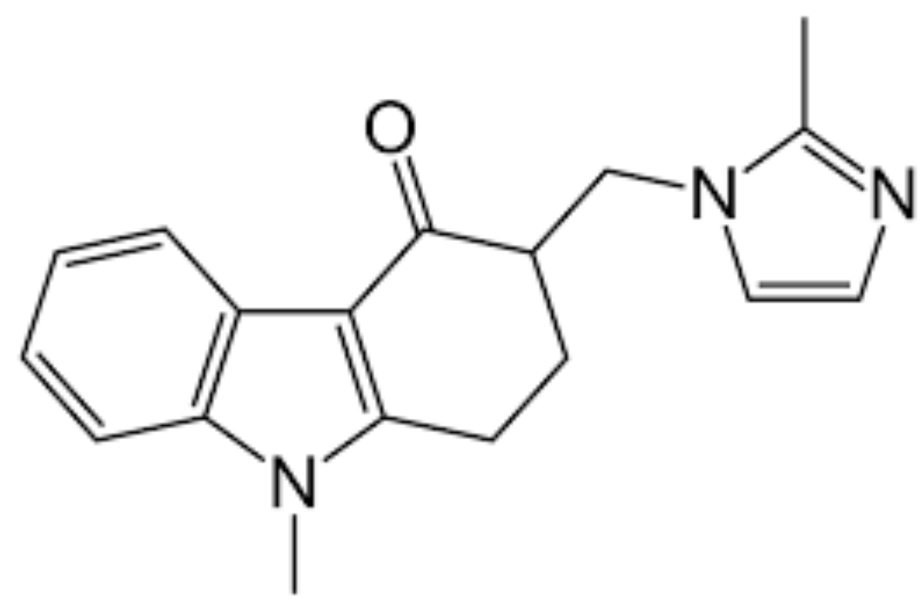
ยาลดอาการคลื่นไส้อาเจียน

Metoclopramide



C14H22ClN3O2

Ondansetron
(1990/2006)



C18H19N3O

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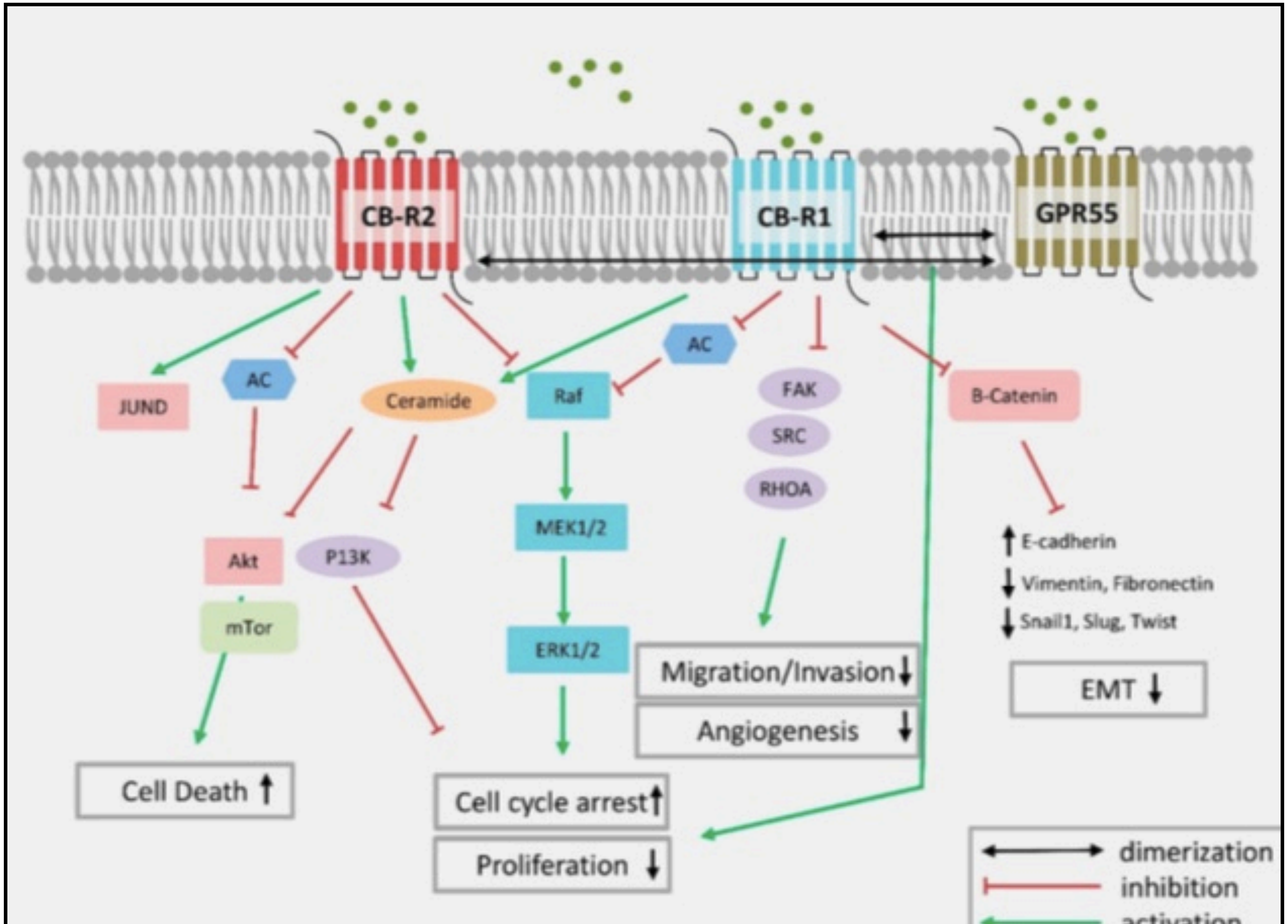
สารสกัดกัญชา กับการรักษามะเร็ง

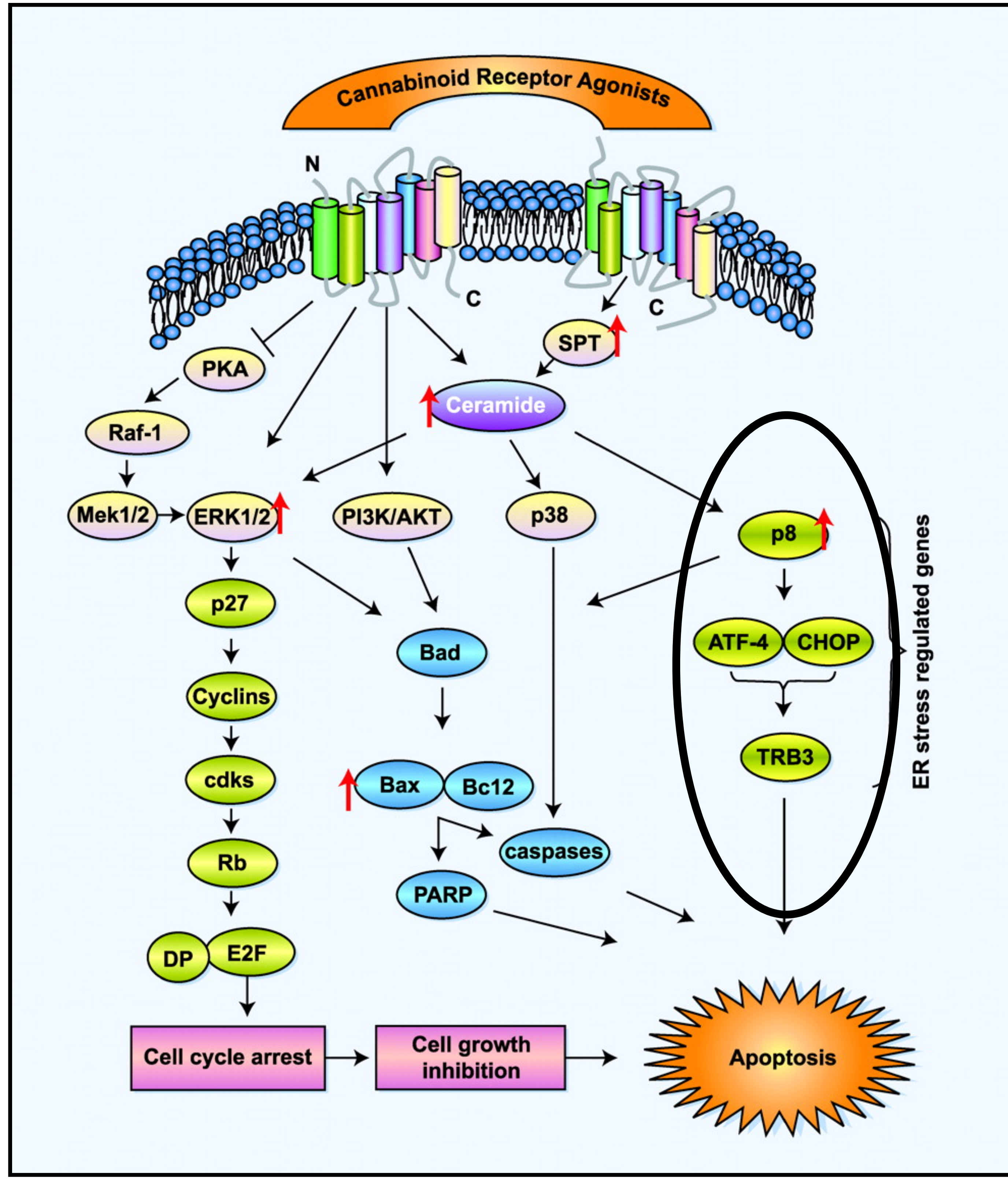
Mechanism of action



Int. J. Mol. Sci. 2019, *20*, 1673; doi:10.3390/ijms20071673

Mechanism of action

CB1-R/ CB2-R/ others



Cancer Research Reviews (AAR) : Jan 2008

Cannabinoids related drugs

Compound	*Target(s)*	*Potential therapeutic applications*
CP-55,940	Nonselective agonist (CB1 = CB2)	Analgesic, antiemetic, appetite stimulant, tumour growth inhibitor, multiple sclerosis
WIN 55,212-2	Nonselective agonist (CB1 = CB2)	Analgesic, antiemetic, appetite stimulant, tumour growth inhibitor, multiple sclerosis
HU-210	Nonselective agonist (CB1 = CB2)	Analgesic, multiple sclerosis, neuroprotective
Δ^9-THC	Nonselective agonist (CB1 > CB2)	Analgesic, antiemetic, appetite stimulant tumour growth inhibitor
Anandamide	Nonselective agonist (CB1 ≫ CB2)	Analgesic, antiemetic, appetite stimulant, tumour growth inhibitor
(*R*)-methanandamide	Nonselective agonist (CB1 ≫ CB2) metabolically stable	Analgesic, antiemetic, appetite stimulant, tumour growth inhibitor
2-AG	Nonselective agonist (CB1 > CB2)	Analgesic, antiemetic, appetite stimulant, tumour growth inhibitor
O-1269	Partial CB1 agonist	
Noladin ether	Selective CB1 agonist	Analgesic
AM-1241 HU-308 JWH-133 JWH-015	Selective CB2 agonists	Tumour growth inhibitor (in glioma, skin carcinoma, lymphoma and leukaemia); multiple sclerosis immune diseases peripheral analgesia
BML190	Nonselective agonist (CB2 ≫ CB1)	

British Journal of Pharmacology (2006) 148, 123–135

Effects of Δ⁹-THC and CBD at sub-micromolar concentrations upon cell viability, motility, and invasiveness in human immortalised cell lines

Cell lines and THC/CBD incubation conditions	Compound tested	Findings	References
HeLa **cervical cancer cells,** serum-free, 72 h	**Δ⁹-THC**	0.01, 0.1, and 1 μM Δ⁹-THC ↓ cell invasion index (Boyden chamber[b]). Effect of 1 μM Δ⁹-THC blocked by AM251 + AM630, by inhibitors of p38 and p42/44 MAP kinase activation, and by siRNA to tissue inhibitor of matrix metalloproteinases-1.	Ramer R & Hinz B (2008) J Natl Cancer Inst. 2008;100:59-69.
LNCaP **prostate cancer cells,** serum-free, 48 h incubation	**Δ⁹-THC**	↑ thymidine incorporation seen with max effect at 0.125-0.25 μM Δ⁹-THC, thereafter tailing off at 0.5 and 1 μM. Similar effect seen with R(+)-methAEA and HU-210	Sánchez MG et al. (2003) FEBS Lett.2003;555:561-6.
PC3 **prostate cancer cells**, serum-free, 48-72 h	**Δ⁹-THC**	50 and 100 nM, but not 250 nM Δ⁹-THC ↑ thymidine incorporation and cell viability (MTT assay, 72 h). 100 nM Δ⁹-THC ↑ Akt phosphorylation, Erk phosphorylation, Raf-1 translocation, and EGFR production (48 h). Experiments with rimonabant and SR144528 and suggest involvement of both CB_1 and CB_2 receptors. Similar results seen with 100 nM R(+)-methAEA.	Sánchez MG et al. (2003) Cell Signal.2003;15:851-9.
Panc1, Capan2, BxPc3, Mia-PaCa2 **pancreatic cancer cell** lines; 0-0.1% fetal bovine serum, 66 h	**Δ⁹-THC**	Capan2 ↑ cell viability (Cell titer 96 assay) at 0.5 & 1 μM Δ⁹-THC; Panc at 1μM alone. No significant effect of 0.5 or 1 μM Δ⁹-THC on MiaPaCa2 and BxPc3 cell viability. All four cell lines show complete loss of cell viability after incubation with 3 and 4 μM Δ⁹-THC .	Carracedo A et al. (2006) Cancer Res.2006;66:6748-55.
AV40-transformed human trabecular meshwork cell line, serum-free, 24 h or 72 h	**Δ⁹-THC**	At concentration range 0.1 nM to 1 μM, no effects of Δ⁹-THC on cell viability (WST-1 assay). Significant ↓ cell migration (Boyden chamber, wound-healing assay) with 0.01, 0.1, and 1 μM Δ⁹-THC. Effect Δ⁹-THC on migration accompanied by ↑ COX-2 activity.	Ramer R & Hinz B (2010) Biochem Pharmacol. 2010;80:846-57.
Granta 519 **mantle cell lymphoma** line, 24 & 48 h, 0 or 10% serum	**Δ⁹-THC**	Presence f serum, 24 & 48 h: no effect on cell viability (propidium iodide staining) at either time point for THC in range 1.6-310 nM, ↓ at 6.3 μM. Absence of serum, 24 h, no effect of 31 nM Δ⁹-THC upon cell proliferation. The cells expressed CB1 receptors.	Richardson SJ et al. (2007) Leuk Lymphoma. 2007;48:1855-7.
U373-MG **glioblastoma cell** line; NCI-H292 **lung carcinoma cell** line, serum-free, 6-24 h	**Δ⁹-THC**	0.1 and 0.3 μM Δ⁹-THC ↑ thymidine incorporation (U373-MG cells, 18 h) and cell viability (MTT assay, NCI-H292, 24 h). Effect blocked by EGFR inhibitor AG1478. No apoptosis seen at 0.1-1 μM THC, but a significant increase at 4-10 μM THC (NCI-H292, 6 h).	Hart S et al. (2004) Cancer Res.2004;64:1943-50.

Source: Fowler CJ (Clin Phamacol Ther.2015;95(6):587-96.)

Effects of Δ^9-THC and CBD at sub-micromolar concentrations upon cell viability, motility, and invasiveness in human immortalised cell lines

Cell lines and THC/CBD incubation conditions	Compound tested	Findings	References
SF126 glioblastoma cell line; 0.1% fetal bovine serum, 72 h	Δ^9-THC	↑ Cell viability (MTT assay) at 0.1 μM Δ^9-THC, thereafter inhibition (IC_{50} value 0.6 μM).	McAllister SD et al. (2005) J Neurooncol. 2005;74:31-40.
Glioma cells from biopsies from three patients with recurrent glioblastoma multiforme; 0.5% fetal bovine serum, 48 h	Δ^9-THC	No obvious effect on cell viability (trypan blue exclusion) at 0.5 μM, but large reduction at 2.5 μM. Biopsies expressed both CB1 and CB2 receptors, and the effect of 2.5 μM Δ^9-THC was blocked by a combination or rimonabant + SR144528.	Guzmám M et al. (2006) Br J Cancer. 2006;95:197-203.
THC-" sensitive" (Gos3, U87, A172, SW1783, U118) and "resistant" (U373, T98, SW1088, CCF, LN405) glioma cell lines, serum-free, 72 h	Δ^9-THC	Possible ↑ cell viability (MTT assay) for some cell lines (e.g., T98), not for others (e.g., SW1088) at 0.5 μM Δ^9-THC. "Sensitive" lines were completely inhibited at 3 μM (IC_{50} <2.5 μM), all "resistant" lines except LN405 (40% reduction) at 4 μM (IC_{50} >2.5 μM).	Lorente M et al. (2011) Cell Death Differ. 2011;18:959-73.
CaCo-2 and HCT116 **colon adenocarcinoma cells**, serum-free, 24 h	CBD	Cell viability: no effect 0.01-10 μM CBD (neutral red uptake assay); no effect at 0.01-1 μM, modest reduction at 10 μM CBD (MTT assay). Thymidine incorporation: Caco-2 cells show ↓ at 0.1, 1, and 10 μM, HCT116 cells only at 10 μM CBD	Aviello G et al. (2012) J Mol Med (Berl). 2012;90:925-34.
Caco-2 **colorectal adenocarcinoma cells**, 1% or 5% serum, 72 h	CBD	Serum-dependent effects in proliferating cells. At 1% serum, an increased cell viability (XTT assay) was seen at <1 μM CBD, ↓ at higher concentration. At 5% serum, only the inhibition was seen. The curves for assays undertaken using physiological O2 concentrations were leftward shifted compared with those at atmospheric O2 concentrations. No effect of CBD were noted on post-confluent cells. In presence of 0.5 mM butyrate and 8% serum, 0.16 μM CBD ↑ cell proliferation (CyQuant assay), Whereas it was blocked by 10 μM CBD.	Macpherson T et al. (2014) In Vitro Cell Dev Biol Anim. 2014;50:427-26.
Human primary **lung carcinoma cells** from a brain metastasis, serum-free, 48 h	CBD	Concentration-dependent ↓ cell viability (WST-1 assay); significant effects seen at all concentrations tested (1 nM – 3 μM; IC_{50} 0.12 μM). Maximum effect (~70% reduction in viability) seen at 1 μM. Effect of 3 μM reduced by COX-2 and PPARγ inhibitors. CBD less potent in A549 and H460 lung carcinoma cell (IC_{50} 3.5 and 2.8 μM, respectively).	Ramer R et al. (2013) Mol Cancer Ther. 2013;12:69-82.
DLD-1 and HCT 116 epithelial **colon adenocarcinoma cells**, serum-free, 24 h	CBD	No significant effect on cell viability (MTT assay) at 0.3, 1 μM, ↓ at 5 μM (and 3 μM for DLD-1 cells).	Romano B et al. (2014) Phytomedicine. 2014;21:631-9.

Source: Fowler CJ (Clin Phamacol Ther.2015;95(6):587-96.)

Effects of Δ^9-THC and CBD at submicromolar concentrations upon cell viability, motility, and invasivity in human immortalized cell lines (Cont.)

Cell lines and THC/CBD incubation conditions	Compound tested	Findings	References
U87MG **glioma cell** line, serum-free, 24 h	CBD	No effect of 0.5 μM CBD, large ↓ at 1-12 μM upon cell invasion (BioCoat Matrigel invasion chamber).	Solinas M et al. (2013) PLoS One.2013;8:e76918.
RPMI 8226 and U266 myeloma cells, 10% serum, 72 h	CBD	No effect upon cell viability (MTT assay) at 0.3 and 1 μM, ↓ at higher concentrations.	Morelli MB et al. (2014) Int J Cancer.2014;134:2534-46.
Karposi sarcoma-associated herpes virus-infected human dermal microvascular endothelial cells, 0.5% BSA, 24 h	CBD	Concentration-dependent apoptosis (in situ cell death detection kit), seen at CBD concentrations ⩾02.5 μM. Apoptosis in infected cells greater than in uninfected cells at CBD ⩽1 μM. Same level of apoptosis (~75%) for infected and uninfected cells at 2-10 μM CBD. Cell proliferation (Cell titer 96 assay): no effect of 1 μM, ↓ at higher concentrations, with greater effect on infected cells than uninfected cells.	Maor Y et al. (2012) Genes Cancer.2012;3:512-20.
MDA-MB231 breast cancer cell line; 0.1% fetal bovine serum, 72 h (cell viability); serum-free, 20 h (invasivity)	Δ^9-THC, CBD	↓ cell viability (MTT, 72 h): IC_{50} values TCA 1.2 μM, CBD 1.3 μM. Invasivity (Boyden chamber, 20 h): no effect of Δ^9-THC at 0.1 or 1 μM, ~50% reduction at 1.5 μM; ~40, ~60, and ~90% reduction at 0.1, 1, and 1.5 μM CBD. CBD effect parallels reduction of 1d-1 expression, and ectopic expression of this protein blocks CBD invasivity.	McAllister SD et al. (2007) Mol Cancer Ther.2007;6:2921-7.
SF126, U251, and U87 glioblastoma, 72 h	Δ^9-THC, CBD	Cell viability (MTT assay): IC_{50} values 2.5-3.3 μM (Δ^9-THC) and 0.6-1.2 μM (CBD). In U251 cells, two-way ANOVAs indicated significant interactions CBD + Δ^9-THC for combination of IC_{20} and IC_{80} concentration. 1.7 μM Δ^9-THC + 0.4 μM CBD: ↑ annexin-positive cells, reduced by SR144528, blocked by a-tocopherol. Combination also ↑ reactive oxygen species. Cell invasion (Boyden chamber): U251 cell IC_{50} values ~85 nM (Δ^9-THC), ~130 nM (CBD). No synergistic effects reported for combination of 100 nM.	Marcu JP et al. (2010) Mol Cancer Ther.2010;9:180-9.
U87MG glioma, serum-free, 72 h	Δ^9-THC, CBD	IC_{50} values for inhibition of cell viability (MTT assay) 1.2 μM (Δ^9-THC) and 1.5 μM (CBD). No significant increase in cell viability seen at low concentrations. Combination of 0.9 μM THC + 0.9 μM CBD ↓ cell viability ~20%, whereas compounds per se had no significant effect. Similar result for SW1783 cells and for combination of Δ^9-THC with tomozolomide (25-75 μM). Effect of Δ^9-THC / CBD combination not seen in cells where autophagy or apoptosis is compromised.	Torres S et al. (2011) Mol Cancer Ther.2011;10:90-103.
Human T98G, U87MG, and mouse GL261 glioma cells, 5% serum, 48 h	THC, CBD and botanical preparations	No obvious effect (mean values in the rage 90-115% of control) of the compounds at 0.5 or 1 μM upon cell proliferation (resazurin reduction assay). The compounds were inhibitory at higher concentrations	Scott KA et al. (2014) Mol Cancer Ther. 2014;13:2955-67.

Source: Fowler CJ (Clin Phamacol Ther.2015;95(6):587-96.)

CB	Cell Line	IC_{50}	Antitumoral Activity	Receptor Mechanism	Citation
THC	MDA-MB-231 MDA-MB-468 SKBR-3 MCF-7 EVSA-T T-47D	5.0 ± 1.2 µM 4.4 ± 0.3 µM 4.5 ± 0.4 µM 10.2 ± 0.7 µM 4.0 ± 0.1 µM 6.7 ± 0.2 µM	Induction of apoptosis Cell cycle arrest, Inhibition of G2-M transition via downregulation of Cdc2	CB2-R	[44]
	MDA-MB-231 MCF-7 4T1	n.d.	Increased production of IL-4 and IL-10 Suppression of the cell-mediated Th1 response and enhancement of the Th2-response	CB1-R CB2-R	[45]
	MDA-MB-231 MDA-MB-468	1.2 µmol/L 2.5 µmol/L	Antiproliferative activity Reduction of invasiveness via ID-1	n.d.	[46]
	MCF-7 MDA-MB-231	14.2 ± 2.1 µM 24.3 ± 4.2 µM	Inhibition of cell growth	CB2-R	[47]
THCA	MCF-7 MDA-MB-231	9.8 ± 0.4 µM 18.2 ± 5.3 µM	Inhibition of cell growth	CB2-R	[47]
CBD	MDA-MB-231 MCF-7 SK-BR-3 ZR-75-1 MCF-10A (n.m.)	n.d.	Inhibition of cell viability Induction of apoptosis/autophagy No influence on cell viability	CB1-R CB2-R TRPV	[27]
	MDA-MB-231 MCF-7	8.2 ± 0.3 µM 10.6 ± 1.8 µM	Inhibition of cell viability Cell cycle arrest at the G1/S transition Induction of apoptosis via pro-caspase-3 cleavage to caspase-3, induction of endoplasmic reticulum stress, inhibition of mTOR and Akt	CB2-R	[47]
	MDA-MB-231 T-47D	2.2 µM 5.0 µM	Induction of apoptosis, inhibition of mTOR, upregulation of PPARγ	n.d.	[48]
	MDA-MB-231 MDA-MB-436	1.3 µmol/L 1.6 µmol/L	Antiproliferative activity Invasiveness reduction via ID-1	n.d.	[46]
CBDA	MDA-MB-231	>100 µM	Inhibition of cell migration by modulating the activity and expression of COX-2	CB1-R CB2-R	[49–52]
	MDA-MB-231	25 µM	Inhibition of cAMP-dependent protein kinase A via activation of the small GTPase, RhoA	CB1-R CB2-R	[51]
	MDA-MB-231	>25 µM	Invasiveness reduction via ID-1 and SHARP1	n.d.	[52]
	MCF-7 MDA-MB-231	21.7 ± 3.2 µM >25 µM	Inhibition of cell growth	CB2-R	[47]
CBN	MDA-MB-231 MDA-MB-468	1.2 µmol/L 2.6 µmol/L	Antiproliferative activity Invasiveness reduction via ID-1	n.d.	[46]

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CB	Cell Line	IC_{50}	Antitumoral Activity	Receptor Mechanism	Citation
CBG	MDA-MB-231 MDA-MB-468	2.3 µmol/L 2.1 µmol/L	Antiproliferative activity Invasiveness reduction via ID-1	n.d.	[46]
	MCF-7 MDA-MB-231	9.8 ± 3.4 µM 20.4 ± 2.6 µM	Inhibition of cell growth	CB2-R	[47]
CBC	MCF-7 MDA-MB-231	14.2 ± 1.4 µM >25 µM	Inhibition of cell growth	CB2-R	[47]
AEA	MDA-MB-231	n.d.	No growth inhibition <10 µM	CB1-R	[53]
	MCF-7 EFM-19 BT-474 T-47D	0.5 µM 1.5 ± 0.3 µM 1.9 µM 1.9 µM	Cell cycle arrest, inhibition of G1/S transition	CB1-R	[54]
	MCF-7 EFM-19	1.4 ± 0.9 µM 1.5 ± 0.3 µM	Inhibition of adenylyl cyclase and activation of MAPK, thereby exerting a downregulation of PRLr and trk	n.d.	[55]
	MCF-7 T-47D	1.4 ± 0.9 µM 1.9 ± 0.2 µM	Inhibition of proliferation, inhibition of forskolin-induced cAMP formation, stimulation of RAF1 translocation and MAPK activity	CB1-R CB2-R TRPV	[56]
	MDA-MB-231	n.d.	Regulation of lipid rafts	CB1-R	[57]
2-AG	EFM-19	n.d.	Cell cycle arrest, inhibition of G1/S transition	CB1-R	[54]
	MCF-7 T-47D	1.4 ± 0.3 µM 5.0 ± 1.1 µM	Inhibition of proliferation, inhibition of forskolin-induced cAMP formation, stimulation of RAF1 translocation and MAPK activity	CB1-R CB2-R TRPV	[56]
Met-F-AEA	MDA-MB-231 T-47D	n.d.	Inhibition of adhesion and migration on type IV collagen without modifying integrin expression	CB1-R	[53]
	MDA-MB-231	n.d.	Inhibition of proliferation by degradation of b-catenin and decrease in cyclin D1, c-Myc and MMP-2 Cell cycle arrest, inhibition of G1/S transition Upregulation of E-cadherin accompanied by the reduction of vimentin, fibronectin and N-cadherin	CB1-R	[58]
	MDA-MB-231	n.d.	Inhibition of angiogenesis by the reduction of pro-angiogenic factors VEGF Reduction of metalloproteinases, TIMP1 and TIMP2	n.d.	[59]
(R)-Met-AEA	EFM-19	0.8 µM	Cell cycle arrest, inhibition of G1/S transition	CB1-R	[54]

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Research Paper

CB_2 cannabinoid receptor activation promotes colon cancer progression via AKT/GSK3β signaling pathway

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Keywords: CB_2, colon cancer, AKT/PKB, JWH-133, proliferation

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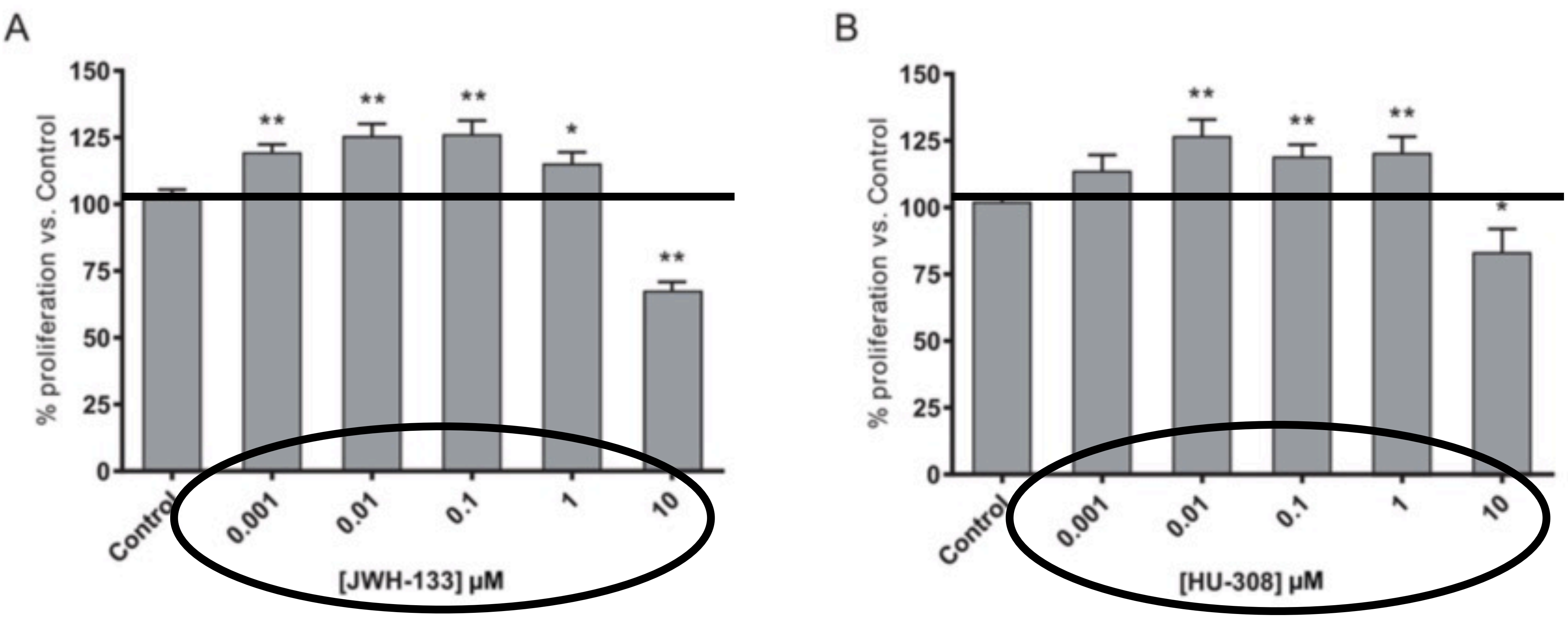

"Dose dependence response"

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Appraising the "entourage effect": Antitumor action of a pure cannabinoid *versus* a botanical drug preparation in preclinical models of breast cancer

Sandra Blasco-Benito[a,b,*,1], Marta Seijo-Vila[a,b,1], Miriam Caro-Villalobos[a,b], Isabel Tundidor[a,b], Clara Andradas[a,2], Elena García-Taboada[a], Jeff Wade[c], Stewart Smith[c], Manuel Guzmán[a,d], Eduardo Pérez-Gómez[a,b], Mara Gordon[c], Cristina Sánchez[a,b,*]

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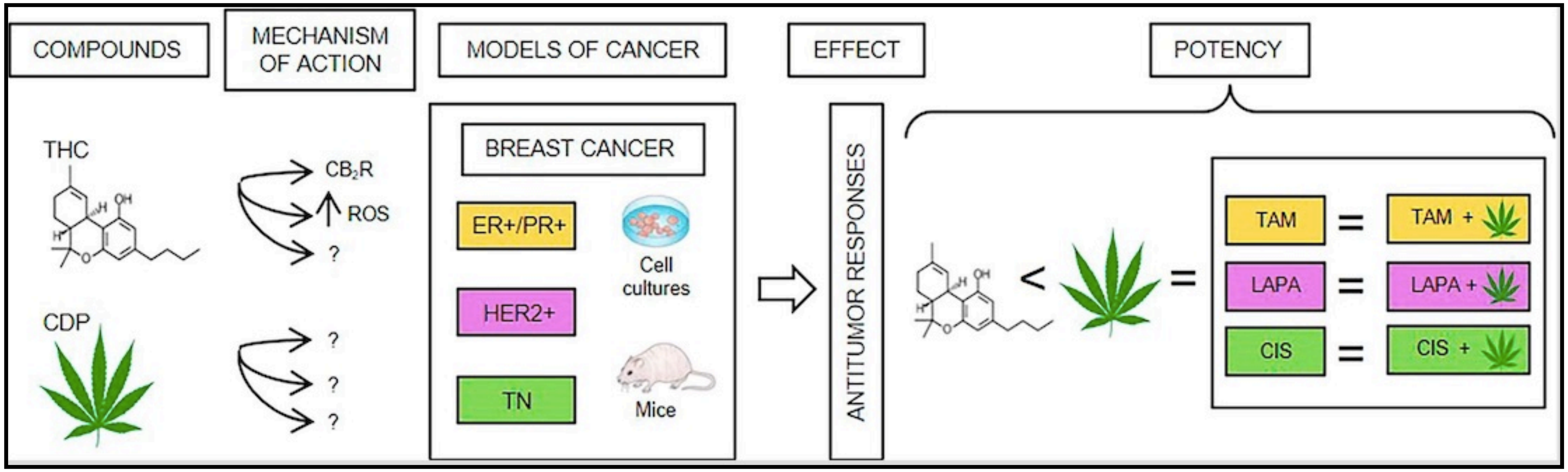
Biochemical Pharmacology 157 (2018) 285–293



"The combination of cannabinoids with estrogen receptor- or HER2-targeted therapies (tamoxifen and lapatinib, respectively) or with cisplatin, produced **additive anti-proliferative** responses in **cell cultures**"

"Combinations of these treatments **in vivo** showed **no interactions**, either positive or negative"

Biochemical Pharmacology 157 (2018) 285–293

อัตราการอยู่รอดชีพ 5 ปี ในมะเร็งชนิดต่างๆ ด้วยการรักษาปัจจุบัน

99.3%

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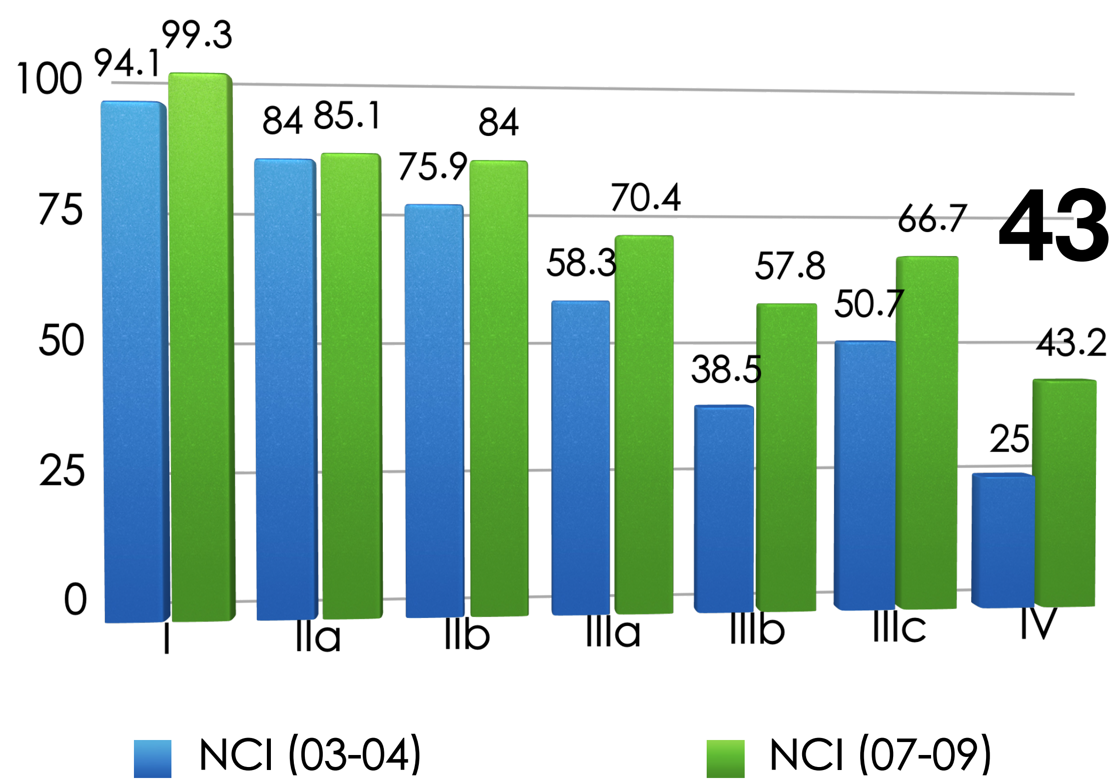

มะเร็งเต้านม

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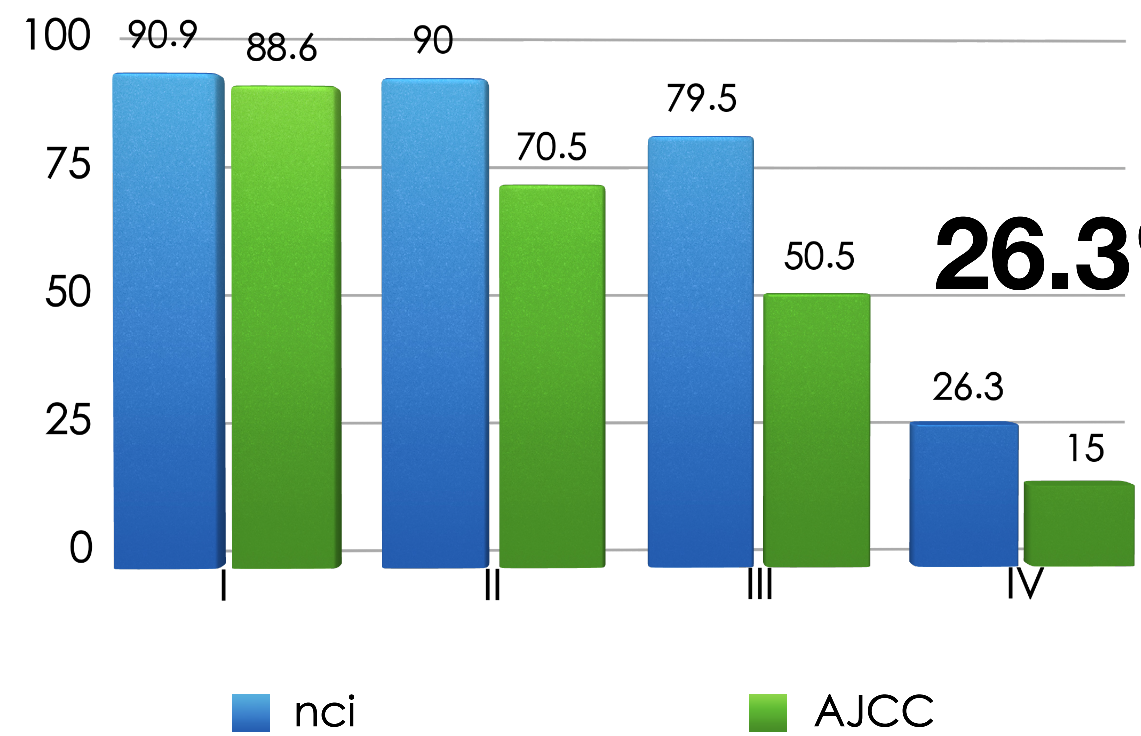

มะเร็งลำไส้ใหญ่

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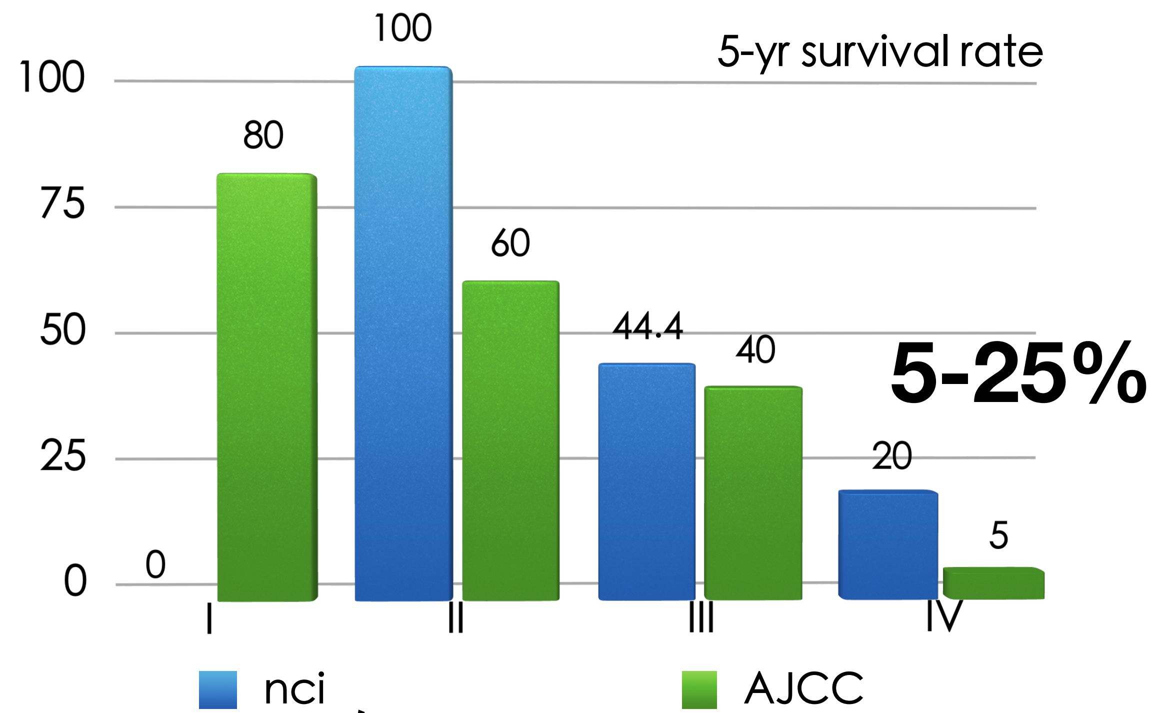

มะเร็งกระเพาะอาหาร

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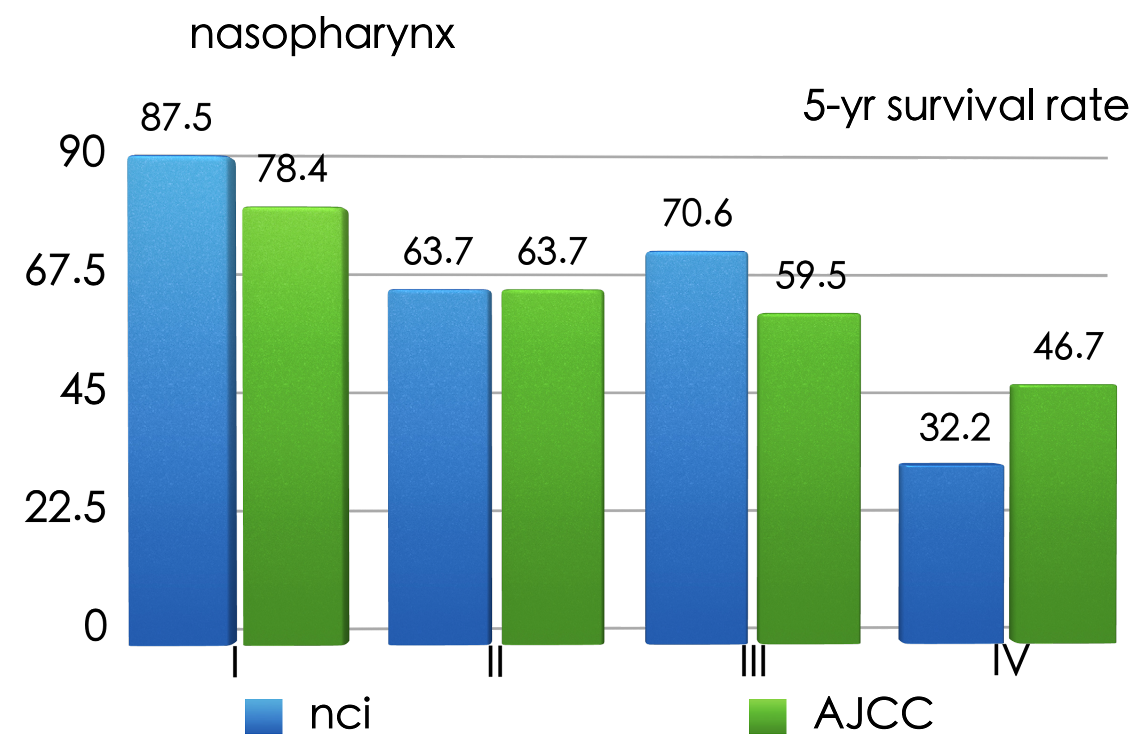

มะเร็งหลังโพรงจมูก

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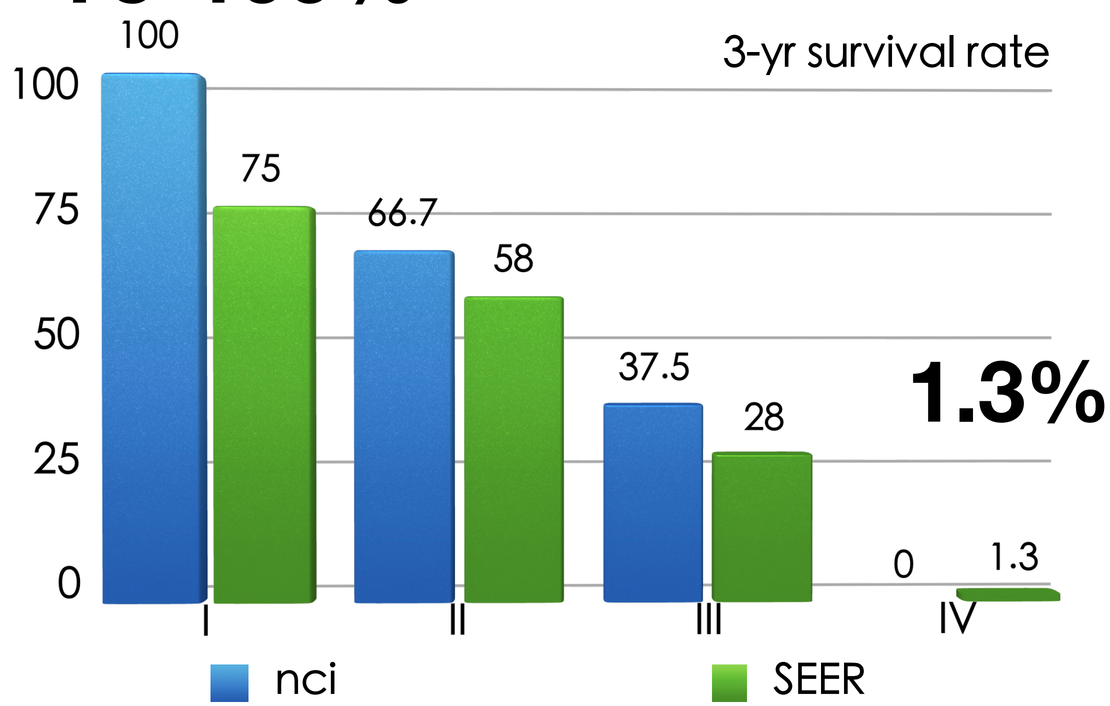

มะเร็งตับ

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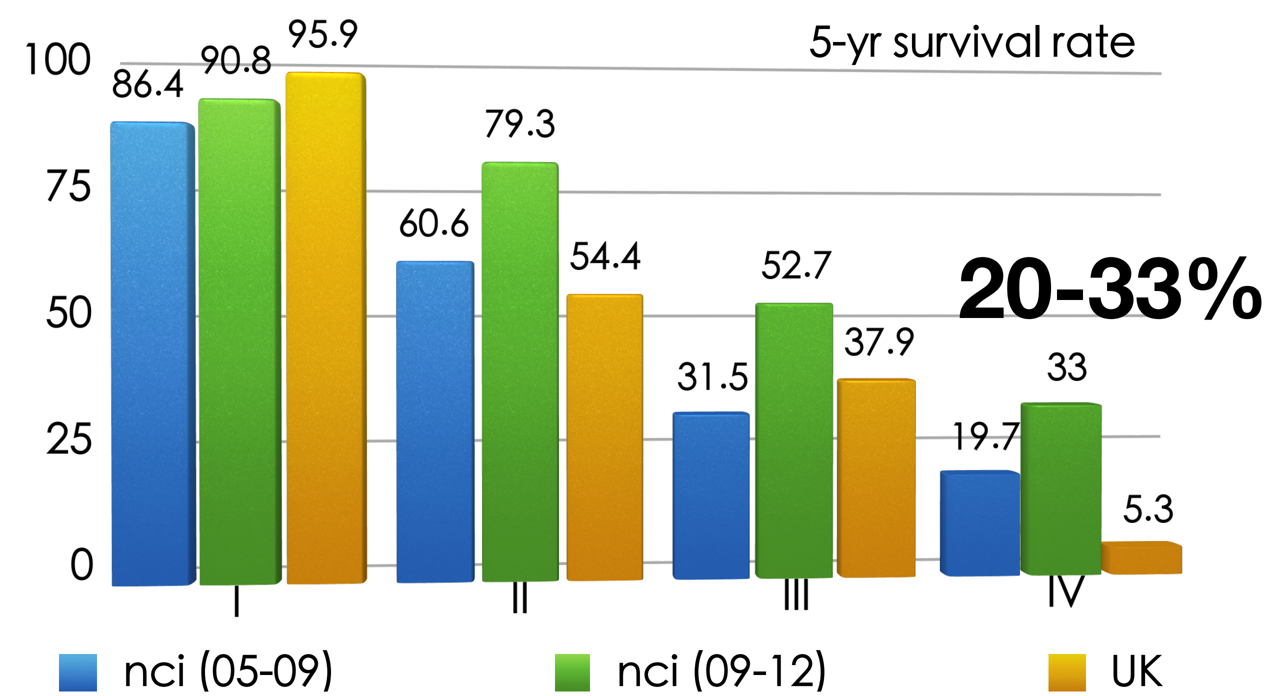

มะเร็งปากมดลูก

ศักยภาพของกัญชา ทางการแพทย์(2)

‘ไม่มี<u>หลักฐาน และข้อมูลเพียงพอ</u> ที่จะสนับสนุนถึงประสิทธิผลของสารสกัดกัญชา ในการรักษามะเร็ง

ศักยภาพของกัญชา ทางการแพทย์(2)

‘มีหลักฐานจำนวนมาก ถึง ประสิทธิผลของสารสกัดกัญชาต่อเซลมะเร็งหลายชนิดในระดับหลอดทดลอง และสัตว์ทดลอง’

เชื่อว่า ผ่านกลไก ทั้ง CB และ non-CB receptor

มีความหลากหลายของส่วนประกอบ THC & CBD ในแต่ละการวิจัย

ศักยภาพของกัญชา ทางการแพทย์(2)

‘ควรมีการพัฒนางานวิจัยทั้งทางระดับหลอดทดลอง สัตว์ทดลองและมนุษย์ เพื่อหาสัดส่วนของสารสกัดกัญชาที่เหมาะสมต่อการรักษามะเร็ง’

กรมการแพทย์
DEPARTMENT OF MEDICAL SERVICES

สารสกัดกัญชา กับอาการปวดจากมะเร็ง

ศักยภาพของกัญชา ทางการแพทย์(3)

‘ไม่มี<u>หลักฐานสนับสนุนเพียงพอ หรือคัดค้าน</u> ถึงประสิทธิผลในการใช้ในการรักษาอาการปวดสำหรับผู้ป่วยมะเร็ง

Nabiximols (THC:CBD =1:1) : ขึ้นทะเบียนครั้งแรกเป็นยาแก้ปวดสำหรับผู้ป่วยมะเร็งในสหรัฐอเมริกา

Source: Whiting et al. (JAMA. 2015;313(24):2456-73.)

ศักยภาพของกัญชา ทางการแพทย์(3)

'ไม่มี<u>หลักฐานสนับสนุนเพียงพอ หรือคัดค้าน</u> ถึงประสิทธิผลในการใช้ในการรักษาอาการกินไม่ได้และผอม สำหรับผู้ป่วยมะเร็งระยะสุดท้าย

ควรพัฒนางานวิจัยเพื่อจะหาข้อสรุป รวมทั้งหาสัดส่วนสารสกัดกัญชาที่เหมาะสม

dr.somchai.t@gmail.com